SECTION 04200

MASONRY UNITS

PART 1 - GENERAL

1.1 SUMMARY

A. Related Sections:
1. Section 05120 – Structural Steel: Steel and special inspection requirements.
2. Section 07112 – Spray On Air Barrier.
3. Section 07210 - Building Insulation: Cavity Insulation.
4. Section 04700 – Manufactured Stone.

1.2 SUBMITTALS

A. General: Submit in accordance with Division 1.

B. Product Data: Submit product data for each type masonry unit, accessory, mortar, mortar color, masonry cleaning agent and other proprietary products.

C. Submit following Informational Submittals:
1. Test Reports:
   a. Submit test reports, in triplicate for each type of CMU, and mortar, from independent testing laboratory certifying that materials meet or exceed specified requirements.
2. Certifications specified in Quality Assurance article.
3. Qualification Data: Installer's qualification data.
4. Manufacturer's instructions.

1.3 QUALITY ASSURANCE

A. Single Source Responsibility:
1. Obtain exposed CMU of uniform texture and color from one manufacturer for each different product required for each continuous surface or visually related surfaces.
2. Obtain mortar ingredients from one manufacturer for each cementitious component and from one source and producer for aggregate.

B. Installer Qualifications: Documented experience on at least 5 projects of similar nature in past 5 years.

C. Fire Resistance Rated Masonry: UL listed or certified to be in compliance with requirements for materials and installation established by governing authorities for construction and fire-resistance rating indicated.

D. Owner reserves right to hire independent masonry consultant to review submittals, procedures, and installation. Installation items subject to review includes, but is not limited to, foundations, flashing, weeps, cavities, joints, tolerances, and cleaning.

E. Certifications:
1. Submit manufacturer's certificates attesting that materials furnished meet or exceed specified requirements.
2. Provide certification of acceptance of masonry cleaning agent by masonry unit, mortar, and mortar color manufacturer.

1.4 MOCK-UP

A. General: Comply with provisions of Division 1.

B. Locate mock-up on site in location as directed.

C. Erect one mock-up, approximately 6'-0" long by 4-0" high. Rebuild wall until written approval is obtained from Architect for material, color, texture, coursing, joint work, weather and moisture tightness, sealants and flashing, and general workmanship.

D. Mock-Up Installation: Show construction techniques, including following:
1. Color range of exposed masonry and mortar joints.
2. Tooled joints.
3. Back-up CMU conditions, including exposed joint work.
4. Base course with flashing and weeps.
5. Air Barrier
6. Cavity wall insulation.
7. Window sill and head with flashing end dam.
8. Shelf angle (including expansion joint condition).
9. Special masonry accent banding.
10. Expansion and control joints.
11. Ties, anchors, and fasteners.
12. Manufactured Stone
13. Cementitous Siding

E. Saturate mock-up with water 5 days after laying and observe if panel effloresces. Recommend cleaning procedures if necessary.

1.5 PRE-INSTALLATION CONFERENCE

A. Conduct pre-installation conference in accordance with Division 1.

B. Review requirements of Contract Documents and submittals.

C. Review requirements for inspection and testing, forecasted weather conditions, governing regulations, insurance requirements, and proposed installation procedures and sequencing.

D. Review anchor, tie, and flashing installation requirements.

E. Review requirements of mock-up on site.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of Division 1.

B. Masonry:
1. Store masonry units off ground to prevent contamination by mud, dust or materials likely to cause staining or other defects.
2. Cover materials to protect from elements.
3. Handle units on pallets or flat bed wheel barrows.
4. Do not permit free discharge from conveyor units or transporting loose in mortar trays or buggies.

C. Mortar Materials:
1. Protect packaged products against contamination and moisture.
2. Stockpile and handle aggregates to prevent contamination from foreign materials.
3. Store admixtures to prevent contamination or damage from excessive temperature changes.
4. Keep water free of harmful materials.

D. Accessories: Protect from damage, moisture, weather, distortion, and from being coated with foreign material.

1.7 PROJECT CONDITIONS

A. Environmental Requirements:
   1. Cold Weather Requirements:
      a. Follow construction and protection requirements in BIA Technical Note No. 1, Rev March, '92. "All-Weather Construction" of Brick Institute of America if surrounding air temperature falls below 40 degrees F.
      b. Mortar setting accelerators and admixtures for cold weather construction are not permitted.
   2. Hot Weather Requirements:
      a. Protect masonry construction from direct exposure to wind and sun when erected in ambient air temperature of 99 degrees F or greater in the shade with relative humidity less than 50 percent.
      b. When ambient air temperature exceeds 99 degrees F, or 90 degrees F with wind velocity in excess of 8 mph, limit installation of mortar to 4 feet ahead of masonry and install masonry within one minute of spreading mortar.

PART 2 - PRODUCTS

2.1 CONCRETE MASONRY UNITS

A. Concrete Masonry Units (CMU):
   1. Standard: ASTM C90, load bearing, hollow units.
   2. Weight Classification: Normal weight, greater than 125 lb/ft^3 at fire rated CMU use lightweight, less than 105 lb/ft^3.
   3. Aggregate: Normal weight, ASTM C33.
   4. Fire-rated CMU: Provide block complying with UL requirements for rating indicated.
   5. Size: Nominal face dimension 16 inches long by 8 inches high by thickness indicated.
   6. Shapes: Provide special shapes where required for bond beams, lintels, corners, jambs, sash, control joints, pilasters, headers, and other special conditions.
   7. Corners: Bull nosed units for outside corners exposed to view, unless indicated otherwise.
   8. Standard Faces: Manufacturer's standard texture and color, unless indicated otherwise.

2.2 MORTAR AND GROUT MATERIALS

A. Proprietary Masonry Cement: Not permitted.

B. Portland Cement: ASTM C150, normal-Type I; gray color except white at glazed CMU. Masonry cement will not be acceptable in lieu of Portland Cement lime mortar.

C. Hydrated Lime: ASTM C207, Type S.

D. Mortar Aggregate: ASTM C144, except graded to pass No. 16 sieve for joints 1/4 inch or less.

E. Grout Aggregate: ASTM C404, sizes #1, #8, or #89.

F. Water: Clean and drinkable.

2.3 ACCESSORIES

A. Acceptable Manufacturers: Products listed are basis of design only; products of the following manufacturer's meeting specified criteria may be used.

1. Dur-O-Wal, Inc., Arlington Heights, IL.
2. Heckmann Building Products, Inc., Chicago, IL.
3. Hohmann and Barnard, Inc., Hauppauge, NY.

B. Corrugated Metal Ties and wire mesh : Not permitted.

C. Horizontal Joint Reinforcing Type 1:
1. Type: Standard truss design, fabricated from ASTM A82 cold-drawn steel wire.
2. Side rods: Two or more continuous 9 gage deformed side rods butt welded in same plane to continuous diagonal 9 gage plain cross rod at 16 inches on centers maximum.
3. Size: Standard length 10 to 20 feet; side rods spaced approximately 2 inches less than width of partition or wall in which placed.
4. Finish: Exterior walls; ASTM A153, Class B-2, (minimum 1.5 ounce per sq. ft. zinc coating) hot-dip galvanized.
5. Provide prefabricated tee and corner units.
6. Acceptable product: Dur-O-Truss, Dur-O-Wal, Inc., Arlington Heights, IL.

D. Flexible Anchors Masonry to Steel:
1. Type: Two piece adjustable type.
2. Size: 9 inches long plain 1/4 inch diameter steel wire or 3/4 inch wide by 12 gage by 9 inches long steel weld-on anchor rod with 3/8 inch offset and 4 inches vertical adjustment, to accept triangular or rectangular shaped 3/16 inch diameter galvanized wire ties of appropriate lengths.
3. Finish: ASTM A153, Class B-2, minimum 1.5 ounce per sq ft zinc coating.
4. Acceptable Product: D/A 709, Dur-O-Wal, Inc., Arlington Heights, IL.

E. Joint Stabilization Anchors:
1. Type: Two 8 gage steel wires enclosed in 1/32 inch sheet metal sleeve that allows movement at expansion or control joints.
2. Finish: Stainless steel.
3. Acceptable Product: D/A 2200, Dur-O-Wal, Inc., Arlington Heights, IL.

F. Steel Plate and Bar Anchors:
1. Type: ASTM A36 steel.
2. Finish: Galvanized; ASTM A153, Class B-2 zinc coating.

G. Reinforcing Bars: Deformed steel, ASTM A615, Grade 60.

H. Expansion Joint Fillers:
1. Type:
   a. Closed cell neoprene complying with ASTM D1056, Class RE41.
   b. Compatible with sealant.
   c. Self adhering on one side; 50 percent minimum compressibility.
2. Size: Thickness to suit joint size; depth to allow sealant application.
3. Locations: Vertical expansion joints, horizontal joints at head of masonry terminating below shelf angles, beams, or slabs; other locations as detailed.
4. Acceptable Product: D/A 2010 and 2015 by Dur-O-Wal, Inc., Arlington Heights, IL.

I. CMU Control Joint Strips:
1. Preformed rubber compound to fit standard sash block.
2. ASTM D2000, Designation 2AA-805.
3. Hardness: 80.
4. Acceptable Product: D/A 2001, Dur-O-Wal, Inc., Arlington Heights, IL.

J. Masonry Cleaning Agents:
1. Non acidic cleaning solution formulated to avoid damage to masonry, mortar, mortar color, and adjacent surfaces.

2. Material and application must be acceptable to masonry and mortar color manufacturer.

K. Cavity Wall Insulation: Refer to polyisocyanurate type specified in Section 07210.

L. Spray On Air Barrier: Refer to Section 07112.

2.4 FLASHING MATERIALS

A. Laminated Copper Flashing:
1. Description: Asphalt free copper fabric flashing, 5 ounce minimum weight.
2. Material: CDA 110 Alloy Copper sheet with 060 temper conforming to ASTM B 370 bonded with a proprietary rubber based adhesive, between two layers of fiverglass fabric weighing not less than 0.3 oz/sq.ft./layer with a minimum of 20x20 threads per inch.
3. Acceptable Manufacturer: Multi-Flash 500 Series Asphalt Free, York Flashings, Inc. or equal.

B. Accessories: Provide solder, sealants, and mastics as required by flashing manufacturer to maintain flashing joints watertight.

2.5 MORTAR AND GROUT MIXES

A. Mortar:
1. ASTM C270 using Proportion Method or BIA M1 Proportion Method.
2. Limit cementitious materials to portland cement and hydrated lime.
3. Use Type S for all other CMU locations, unless noted otherwise.

B. Site Mixed Mortar: Combine and thoroughly mix cement, aggregates, color admixture, and water in mechanical batch mixer. Use proportion measuring method to ensure accuracy and consistency; shovel method is not acceptable.

C. Grout:
1. Do not add admixtures including coloring pigments, air-entraining agents, accelerators, retarders, water repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.
2. ASTM C476, fine aggregate in spaces less than 2 inches.
3. Proportion to produce 2500 psi compressive strength at 28 days with 9-1/2 inch slump when placed.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions and proceed with work in accordance with Division 1.

B. Do not proceed with manufacture or procurement of masonry elements or mortar until all related shop drawings, mix designs, and color samples are approved, and mock-ups are constructed and approved.

C. Examine conditions and proceed with work.

D. Verify items provided by other Sections of work are properly sized and located.

E. Examine foundations and supporting members to ensure surfaces are within tolerances, at proper elevations, and are free from dirt or other deleterious matter.
1. Verify concrete foundations comply with ACI 117 for concrete construction tolerances.

F. Determine rooms and space which do not receive ceiling to ensure exposed joint work is properly struck.

3.2 PREPARATION

A. Receive approval for required mock-up before proceeding further.

B. Establish lines, levels, and coursing; protect from disturbance.

C. Provide temporary bracing during erection of masonry work. Maintain in place until building structure provides permanent support.

D. Provide temporary supports under masonry support systems when necessary. Retain in place until mortar has attained adequate strength.

E. Wetting Masonry:
   1. CMU: Do not wet concrete masonry units.

3.3 INSTALLATION

A. Tolerances: Remove work not conforming to specified tolerances and reconstruct to proper tolerances.
   1. Variation from Plumb: 1/4 inch per story non-cumulative; 3/8 inch maximum in two stories or more.
   2. Variation from Level Coursing: 1/8 inch in 3 feet; 1/4 inch in 10 feet; 1/2 inch maximum.
   3. Variation from Unit to Adjacent Unit: 1/32 inch maximum.
   4. Variation from Plan Location: 1/4 inch in 10 feet and 1/2 inch maximum in 20 feet or more.
   5. Alignment of Columns and Pilasters: Maximum 1/4 inch from true line.
   6. Variation in Sizes of Wall Openings: Minus 0 inch to plus 1/4 inch.
   7. Variation in Location of Wall Openings: Plus or minus 1/4 inch.
   8. Variation of Joint Thickness: 1/8 inch in 3 feet.
   9. Maximum Variation from Cross Sectional Thickness of Walls: Plus or minus 1/4 inch.

B. Flashing: Install in accordance with manufacturer's instructions and as follows:
   1. Clean surfaces to receive flashing; remove rough projections to avoid damage to flashing.
   2. Extend flashings, turn up minimum of 8 inches, secure flashing into substrate or reglet.
   3. Lap joints minimum of 4 inches and seal with manufacturer's recommended materials.
   4. Continue flashing around corners. Ensure flashing material is not interrupted in horizontal plane at corners.
   5. Lay masonry units, without mortar bed, directly on top of flashing which occurs over steel lintels or shelf angles only.
   6. Where flashing does not extend continuously for full length of wall (such as over lintels and under sills at openings) form watertight end dams at each end of flashing.

C. General:
   1. Except as indicated otherwise, place masonry in full bed of mortar, properly jointed with other work, to lines and levels indicated. Align head joints plumb within vertical tolerance.
   2. Maintain masonry courses to uniform width. Make vertical and horizontal joints equal and of uniform thickness.
   3. Apply mortar to obtain full vertical head joints.
   4. Slushing of head joints or furrowing of bed joints is prohibited.
   5. Lay CMU in running bond. Course one block unit and one mortar joint to equal 8 inches.
   6. Fully bond intersections, external corners and internal corners, except where indicated otherwise.
   7. Do not shift or tap masonry units after mortar has taken initial set. Where adjustment must be made, remove mortar and replace.

8. Remove excess mortar as work progresses.
9. Perform Project site cutting with proper tools to provide straight unchipped edges. Take care to prevent breaking masonry unit corners or edges.
10. Form flush mortar joints where interior resilient base is indicated.
11. Form flush mortar joints for exterior below grade work where scheduled to receive bituminous dampproofing. Form concave mortar joints for other work.
12. Provide pressure relieving joints at top of non-loadbearing walls by placing continuous joint filler (no mortar) in horizontal joint immediately beneath shelf angle or structure.
13. Provide firestops consisting of safing and fire-rated sealant as specified in Section 07840 at control joints and at top of fire-rated CMU walls.
14. Isolate masonry partitions from vertical structural framing members with a control or expansion joint as indicated.
15. Provide pressure relieving joints by placing continuous joint filler (no mortar) in horizontal joint immediately beneath shelf angle.
16. Place control joint strips in CMU control joints.
17. Do not install cracked, broken, or chipped masonry.
18. All exposed joints are to be struck with concave joint.
19.

D. Cavity Wall:
   1. Mortar Boards:
      a. Maintain cavity clear of excess mortar and debris.
      b. Prevent accumulation of mortar droppings by placing boards in cavity, cut slightly narrower than cavity width, and supported on wall ties.
      c. When masonry reaches next level for placement of reinforcement, raise boards by attached wires at ends and discard debris from boards.
      d. Replace mortar dropping boards on ties for next courses.
      e. Continue process as work progresses to top of wall.
   2. Build inner wythe ahead of outer wythe to receive spray applied air barrier.
   3. Coordinate placement and provisions for air barrier and board insulation with Sections 07112 and 07210.

E. Masonry Lintels and Bond Beams:
   1. For hollow concrete masonry unit walls, use specially formed bond beam units with reinforcement bars placed as indicated and filled with coarse grout.
   2. Provide minimum bearing of 8 inches at each jamb, unless otherwise indicated.
   3. Provide bond beams at top of walls and other locations where indicated; provide masonry lintels above door openings where indicated.
   4. Reinforce bond beams and lintels with minimum of two No. 5 bars and fill solid with grout.
   5. Discontinue bond beams at control and expansion joints.

F. Loose Steel Lintels: Grout cells in CMU immediately below steel lintels.

3.4 ACCESSORIES

A. Horizontal Joint Reinforcement:
   1. Place reinforcement centered in interior and exterior masonry walls in every second bed joint (16 inches on centers). Place reinforcement in first and second bed joints (8 inches on centers) above and below openings in masonry walls.
   2. Where possible, extend the reinforcement in the second bed joint above and below openings at least 24 inches beyond each side of the opening.
   3. Lap ends of reinforcement a minimum of 6 inches at splices and cut and bend corners in accordance with the manufacturer's instructions. Do not lap corners of reinforcement. Center reinforcement side rods over the outside face shell of hollow units.
   4. Do not extend horizontal joint reinforcement through control or expansion joints in masonry walls, unless specifically indicated otherwise.

B. Wire Mesh Ties:
   1. Install in every second bed joint (16 inch on centers) where interior non-load-bearing walls intersect other interior non-load-bearing walls and bearing or non-load-bearing exterior walls, except where a vertical control or expansion joint is indicated.
   2. Extend minimum of 8 inches in longitudinal wall and to within 1 inch of outside face of intersecting wall.

C. Flexible Masonry To Steel Anchors:
   1. Secure masonry walls to structural steel with anchors specified.
   2. Position anchors 16 inches on centers vertically on columns.
   3. Install anchors on beams where beam interrupts veneer back-up. On beams up to 16 inches deep, space anchors along center line of beam, 16 inches on centers horizontally. On beams over 16 inches deep, space anchors 16 inches on centers vertically and 16 inches on centers horizontally.
   4. Full weld all clips and rods, and install anchors in full bed of mortar.
   5. Do not place in same course as horizontal joint reinforcement.

D. Joint Stabilization Anchors:
   1. Install 4 feet on centers vertically in bed joints where interior control or expansion joints occur and where interior masonry walls intersect other interior masonry walls or exterior masonry walls.
   2. Install in accordance with manufacturer's instructions. Grout fill cores of masonry units for anchor embedment.
   3. Place layer of mesh joint reinforcement in course directly below anchor to support grout filled core.
   4. Do not place anchor in same mortar bed containing horizontal joint reinforcement.

3.5 MOVEMENT JOINTS

A. CMU Joints:
   1. Install control joints to as shown. If joints are not indicated, install as noted below:
      a. Changes in thickness, height, and direction of wall.
      b. Between 1 and 4 feet of corners and offsets.
      c. 30'-0" on centers maximum run of uninterrupted wall.
      d. 15'-0" on centers maximum length for parapet walls.
      e. At control or expansion joints in structure.
      f. At one side of openings greater than 24 inches.
   2. Ensure joint is free from mortar and horizontal reinforcing.
   3. Horizontal joints: Install joint fillers in joint underneath shelf angles, beams, slabs, and decks for nonbearing wall applications.

3.6 BUILT-IN WORK

A. As work progresses, build in metal frames, window frames, wood nailing strips, anchor bolts, plates, and other items to be built in work supplied by other sections.

B. Build in items plumb and level to tolerances indicated.

C. Bed anchors of metal frames in mortar joints. Fill frame voids solid with mortar. Fill masonry cores with grout minimum 12 inches from framed openings.

D. Do not build-in organic materials subject to deterioration.

E. Bed anchors of metal frames in mortar joints.

3.7 ADJUSTING

A. Cut out and repoint defective mortar joints to match adjacent work.

B. During tooling of joints, enlarge voids and holes and completely fill with mortar matching adjacent.

C. Remove and replace masonry units which are loose, chipped, broken, stained, or otherwise damaged. Provide new units to match adjoining units and install in fresh mortar pointed to eliminate evidence of replacement.

3.8 CLEANING

A. After mortar has set dry brush brick face to remove excess mortar, smears and stains prior to end of each work day.

B. Test cleaning products at field sample panel or other location as directed.

C. Clean stained surfaces with non-acidic solution of type which will not harm masonry or adjacent materials. Follow manufacturer's instructions. Consult masonry manufacturer for acceptable cleaners.

D. Do not allow cleaning solution to etch mortar joints, masonry, foundations, or windows.

E. Cleaning tools: Non-metallic.

F. Clean-up debris and refuse created by masonry work and remove from site.

3.9 PROTECTION

A. Protect finished work in accordance with Division 1.

B. General:
1. Protect sills, ledges, and projections from mortar droppings or other damage during construction.
2. Maintain protective boards at exposed external corners, sills, ledges, and projections to avoid damage by construction activities.

C. Wall Covers:
1. Cover partially completed walls with impervious sheets when work is not in progress.
2. Extend cover down 24 inches minimum on both sides of wall and secure in-place to prevent moisture infiltration and protect from weather.

D. Protect wall at scaffold work platform. Turn-up scaffold boards at end of day to reduce mortar stains on walls during wet weather.

E. After completion of masonry work protect top of walls until wall caps and flashings are in place.

END OF SECTION